A Naturalistic Observational Study of Children's Expressions of Anger in the Family Context

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Traditional approaches to the study of children's expressions of anger rely on tightly controlled study environments to test hypotheses about outcomes and correlates of expression characteristics. An unexplored area in the study of emotion expression is a naturalistic examination of school-age children's spontaneously occurring expressions of emotion in their real, uncontrolled family contexts. This observational study describes the naturally occurring characteristics and contexts of 8- to 12-year-old children's anger expressions with family members. Thirty-one families were videotaped for 2 days at home and in community settings. Children's expressions of anger were identified and coded for angry facial, vocal and physical behaviors, and for the expressions' instigating situational contexts. The majority of anger expressions were of mild intensity and brief duration, and most often contained vocal behavioral characteristics (e.g., loud voice, whining). The most common cause of an anger expression was a verbal disagreement; other frequently occurring situational causes included homework, requests for compliance, and reprimands. Patterns in the angry behaviors children exhibited in response to specific situational causes support a functionalist perspective on emotion expression in that children engaged in behaviors that appeared to be attempts to get their needs met. Few differences were observed between mothers' and fathers' rates of instigating children's anger expressions, and between boys' and girls' expression characteristics and contexts. This study offers an ecologically valid, uniquely naturalistic methodology to describe children's observable expressions of anger as they occur in family contexts.

Keywords: emotion expression, anger, parent–child interactions, naturalistic

To isolate components of complex emotional processes, children's emotion expressions are often studied in the context of a uniform set of parameters. For example, laboratory study participants may experience the same likelihood of failure in a frustrating task (Dennis, Cole, Wiggins, Cohen, & Zalewski, 2009; Underwood, Hurley, Johanson, & Mosley, 1999), mothers and fathers may jointly participate in a semiscripted discussion in order to examine parent gender differences (Fivush, Brotman, Buckner, & Goodman, 2000), or standardized vignettes may assess children's beliefs about appropriate emotion expression (Parker et al., 2001). In short, the wide range of children's actual daily experiences is restricted to allow for effective hypothesis testing.

This naturalistic observational study describes the *other* side of children's emotion expression, a side that remains largely unexamined in the literature (Campos, Frankel, & Camras, 2004; Morris, Silk, Steinberg, Myers, & Robinson, 2007): the completely uncontrolled, real daily family contexts that give rise to school-age children's expressions of anger, and those expressions' naturally occurring characteristics. Instead of controlling environments to break down and isolate specific constructs, this study takes a more ethnographic approach to describing the whole context of children's expressions of angry emotions as they occur with their families. In other words, if we let families do what they do, however they do it, what do we see? *How* do children express feelings of irritation, frustration, and anger, *why*, and with *whom*?

This article describes school-age children's naturally occurring anger expressions and the circumstances in which those expressions manifested using data from a unique naturalistic observational study of families conducted by the UCLA Center on Every-

day Lives of Families (CELF). Families were recorded engaging in everyday activities at home and in community settings. To provide an inclusive picture of child behavior, we examine a wide range of angry behaviors, from physical aggression to fleeting irritation or annoyance, to more comprehensively describe the spectrum of angry emotions children typically express. The methodology, made increasingly possible with constantly evolving audio and video recording technologies and ever-improving observation-based emotion coding practices, offers an alternative perspective through which researchers can study children's emotion expressions. Ideally, this study will complement and build on existing laboratory and questionnaire studies to provide a more thorough understanding of children's emotions.

Background

Anger and Its Functions

Child anger has been a particular target of emotion research because of its ramifications for social and behavioral dysfunction (e.g., through externalizing behaviors; Kerr & Schneider, 2008; Sullivan, Helms, Kliewer, & Goodman, 2010). Generally speaking, anger is defined as a person's response to a threatening or frustrating situation, that is, an obstacle to obtaining a goal (Campos, Campos, & Barrett, 1989; Kerr & Schneider, 2008). A functionalist perspective on emotion additionally defines anger as a relational, interpersonal process rather than a purely internal experience (Campos et al., 1989). According to this perspective, behaviors lose their meaning when removed from their context: This has major implications for the study of emotion expression (Zeman, Klimes-Dougan, Cassano, & Adrian, 2007). Child observational studies often compare expressions of anger relative with other emotions (e.g., anger, sadness, and happiness; Hubbard, 2001; Kerr & Schneider, 2008), and relate those proportions to adjustment outcomes. However, a functionalist perspective suggests that simple associations between amounts of anger expressed and emotional, social, and behavioral outcomes do not sufficiently account for the day-to-day utility of anger in particular contexts (Campos et al., 2004; Ford & Tamir, 2012; Izard, 1991). For example, anger may mobilize and energize individuals to be interpersonally assertive and, thus, more likely to have their needs met (Izard, 1991; Izard, Stark, Trentacosta, & Schultz, 2008). Both whining and crying garner attention but only crying results in parental comforting (Baskett, 1985), whereas whining expresses a desire or refusal (Chang & Thompson, 2010; Sokol, Webster, Thompson, & Stevens, 2005). Evidence for the differential functionality of different anger-expressive behaviors in different contexts (e.g., with different interaction partners) calls for increased attention to the social context of children's anger expressions—particularly family contexts (Morris et al., 2007). In addition, instead of focusing only on the frequency and valence of emotion, this functionalist perspective highlights the importance of the dynamic features of emotion expression that give them meaning (e.g., expression intensity and duration; Thompson, 1994).

Though laboratory studies have addressed dynamic features of anger expressions (e.g., Cole et al., 2011), controlled settings limit ecological validity by restricting context and opportunities to engage in the kind of functional responses children might ordinarily employ. For example, a child told she cannot have a sweet at home

might ask for something else she knows she is available, such as a piece of fruit; a child being taunted by a sibling can "tell on him" and enlist the aid of a parent. The laboratory can approximate these scenarios: forbidden sweets may be left out, or a confederate child may taunt during a game. Because of the difference in setting, however, these scenarios may not evoke the children's familiar behavioral patterns (whether their typical responses are available to them or not). Further, observational studies that focus solely on the characteristics of expressive behaviors often neglect their functional purpose, a component of emotion that is particularly in need of further exploration (Zeman et al., 2007). This study took a novel naturalistic observational approach to (a) examine structural aspects of children's anger expressions in their whole, natural family context (i.e., the dynamic features of expressive behaviors and the expressions' naturally occurring contexts); and (b) link the behaviors children use to express anger with the expression's specific interpersonal context, as a different means of studying the functionality of angry behaviors.

Characteristics of Children's Anger

Previous observational research has offered detailed accounts of the visible attributes of children's expressions of anger. Behavioral characteristics that have been identified as signifying anger include a furrowed brow, lips pressed together or set into a hard line, verbal aggression (e.g., screaming, yelling, name-calling), and physical aggression (e.g., pinching, hitting, kicking; Green, Whitney, & Potegal, 2011; Hubbard, 2001; Kerr & Schneider, 2008; Strayer & Roberts, 2004). Observations of anger expression intensity and duration have also advanced our understanding of the developmental trajectory of angry behaviors (Cole et al., 2011).

Investigators employ diverse procedures to identify and describe the behavioral characteristics of child anger, from focusing a video recorder on minute, subtle details of a child's facial expression or body movement and posture (Dael, Mortillaro, & Scherer, 2012; Ekman, 1992; Gottman, McCoy, Coan, & Collier, 1996), to applying broad behavioral definitions of physical or vocal behaviors (e.g., "damaging property" or "nonverbal teasing;" Barry & Kochanska, 2010; Miller, Danaher, & Forbes, 1986; Strayer & Roberts, 2004), to relying upon a cultural informant perspective, meaning coders draw upon their own experience to identify and classify different emotions (Underwood et al., 1999). The latter practice is supported by research advocating the definition of emotion as a social construction that requires culturally based interpretations to confer meaning on emotional expressions (Barrett, 2012).

In line with this study's aim of addressing normative child behavior, we code a wide range of angry expressions rather than focusing only on high intensity events (Underwood et al., 1999). This approach uniquely allows us to examine associations between naturally occurring situations that instigate children's anger, such as reprimands, and expression intensity. Observational studies that address a similarly wide spectrum of anger intensity levels report a range of interrater reliability coefficients (from .54 to 1.0; Barry & Kochanska, 2010; Hubbard, 2001; Miller et al., 1986; Snyder, Stoolmiller, Wilson, & Yamamoto, 2003; Underwood et al., 1999). The results of these investigations, which include environmental controls absent in the current project, would forecast more modest interrater reliability estimates for this study's inclusive, ecologi-

cally valid approach (Underwood et al., 1999) than are described in studies that include a more restricted range of emotion expression (i.e., only very high intensity expressions; Fabes & Eisenberg, 1992).

Frequency of Children's Anger Expressions

The likelihood of expressing anger may be affected by individual characteristics, such as age, gender, or emotional lability, and situation characteristics, such as the length of time passed since the child's last expression of anger or particular characteristics of the anger-inducing event or task. A number of laboratory studies have estimated the frequency with which children express anger; most are conducted with young children, such as preschoolers (Kerr & Schneider, 2008). Previous estimates based on studies of 5- to 6-year-olds range from 3.7–6 expressions per hour (Snyder et al., 2003; Strayer & Roberts, 2004; Walter & LaFreniere, 2000). Each study used its own behavioral definition of "anger," ranging from verbal and physical aggression to minor facial signals such as frowning, and of course observed the behaviors in specific contexts (in terms of activities, setting, and interaction partners). With respect to the frequencies with which children engage in particular angry behaviors, one naturalistic study of 4- to 6-year-olds at home with their parents found that the children whined and argued/ fought just under once per hour (Slatcher & Trentacosta, 2012). Young children's angry behaviors in response to very frustrating or disappointing events in the laboratory (e.g., Cole et al., 2011; Hubbard, 2001) are not expected to be comparable with school-age children's behavior in everyday circumstances, and are not described in detail here.

Middle childhood is a period during which patterns of emotion regulation and social and emotional competence are thought to be relatively stable and internalized, meaning their behavior and beliefs about emotion may be less affected by environmental factors (Cole, Michel, & Teti, 1994). That logic, along with the ability to describe internal emotional and regulatory experiences, may explain why studies of school-age children have primarily focused on self-reported beliefs about emotion expression (Archer, 2004; Kerr & Schneider, 2008). Direct observation of older children's real emotion expressions, captured just as their interaction partners see them—*particularly* in the naturalistic settings described here—offer a significant unique contribution to the emotion literature.

Contexts of Children's Angry Expressions

A long history of laboratory-based research has revealed a number of contextual factors that are likely to induce anger, from Dollard, Doob, Miller, Mower, and Sears' (1939) original frustration–aggression hypothesis to more specific cues, such as social situations that involve a real or imagined threat, violated expectations, perceived injustices, and the instrumental value of angry behavior in a given situation (Buss, 1963; Kerr & Schneider, 2008; Whitesell & Harter, 1996). The specific angry behaviors, however, change according to features of the context: They vary across frustrating games within a single study, and depend on the behaviors of the interaction partner (Dirks, Treat, & Weersing, 2007; Hubbard, 2001). There have been few investigations of real life causes of children's anger and of the frequency with which

those occasions actually arise. The major exceptions to this rule are the naturalistic and seminaturalistic studies that have examined toddlers' and preschoolers' anger expressions in family (Barry & Kochanska, 2010; Slatcher & Trentacosta, 2012) and peer contexts (Fabes & Eisenberg, 1992; Strayer & Roberts, 2004).

A naturalistic video study like the one conducted by CELF offers psychologists the rare opportunity to identify the impromptu family circumstances in which children express anger. Our strategy was to document when (and how) anger was expressed and then chronicle the surrounding events and other situational factors. These analyses allowed us to identify contextual factors as they arose naturally in children's daily lives, rather than limiting constructs to those defined prior to data collection or imposing conditions in a laboratory setting.

Sex Differences in Children's Expressions of Anger

Sex differences in the frequency, intensity, and type of overt anger behaviors and language have been observed in school-age children's anger expressions in the laboratory and in self-report studies. For example, school-age boys are more likely than girls to engage in peer conflict and in direct verbal and physical aggression (Archer, 2004; Miller et al., 1986). One laboratory experiment found that 8-year-old boys exhibited angry facial expressions, verbal tone, and physical behaviors around two times as often as girls did during a frustrating game (Hubbard, 2001). We test for sex differences in the behavioral characteristics of children's anger expressions and the everyday settings in which they occur; however, given the small sample size, it is likely that this study is underpowered to detect small effects reported in larger studies.

Differences Between Interactions With Mothers Versus Fathers

Studies of maternal influences on child emotion expression, regulation, and socialization vastly outnumber studies of paternal influences (Barry & Kochanska, 2010). Nonetheless, evidence suggests that mothers and fathers play different roles in children's emotional lives. For example, school-age children (regardless of gender) report regulating their emotional expressions more in the presence of their fathers than their mothers (Zeman, Cassano, Perry-Parrish, & Stegall, 2006). In a call for further research on the role of fathers in children's emotion socialization, Parke and McDowell (1998) cite differences between children's interactions with their mothers (who on average are more verbal, didactic, and moderate in their emotional responses) and fathers (who tend to be more physical and unpredictable). In its examination of the whole family context of children's anger as opposed to a more limited dyadic approach, the current study examines whether there are differences in how children express anger and in the events that cause anger when children's anger expressions have been instigated by their mothers versus their fathers.

The Present Study

To summarize, the present study used naturalistic video recordings of families to extend previous research on children's expressions of anger by examining the specific characteristics and contexts of angry expressions when children are with their parents.

The primary aim is to capture a wide range of anger expressions—from mild irritation to full-blown displays of anger and aggression—in order to comprehensively describe (a) the frequency with which different characteristics of anger (e.g., angry behaviors, intensity and duration) are displayed by school-age children in natural family settings; (b) the situational contexts in which anger expressions occur, and (c) associations between the expressions' characteristics and a variety of situational variables. To address the third goal, children's angry behaviors and the contexts of their anger expressions will be compared (a) in boys versus girls, (b) during interactions with mothers versus fathers, and (c) when the intensity of the anger is high versus low. Finally, in an attempt to explore the potential functionality of children's anger in interpersonal situations, we examine associations between the particular social contexts in which anger was expressed (such as a disagreement with another person or a request for compliance) and the manner in which the child expressed anger (such as whining or a physical behavior).

Method

Participants

The interdisciplinary UCLA CELF study provides a comprehensive look at 1 week in the lives of a diverse group of 32 middle-class families in the Los Angeles area. Each family was required to have: (a) two cohabiting, dual-earning adults each working 30 or more hours each per week; (b) a monthly mortgage on their home, and (c) two to three children, at least one of which (the "target child") was between the ages of 8 and 12. Families were compensated $1,000 for participation in the study. Two families in the sample were headed by male same-sex couples, and the rest were headed by heterosexual couples. More information on specific recruitment strategies, costs, and details on postcollection efforts to organize the data (e.g., transcriptions and video searching software) has been published previously (Ochs, Graesch, Mittmann, Bradbury, & Repetti, 2006; Ochs & Kremer-Sadlik, 2013).

The present study utilizes data from 31 of these families (as one family did not have a child within the age range that had been specified for the study). In analyses where mother–child interactions or parent gender differences are examined, the two families with male same-sex parents were excluded; in these two couples, one of the fathers was randomly selected for analysis of father–child interactions. Of the 31 target children included in this study (one from each family), 17 were boys and 14 were girls. Four of the target children were adopted by the participating parents, and three were biological children of the participating mother and stepchildren of the participating father. Twenty (65%) were European American, three (10%) were Asian American, one (3%) was Latino, one (3%) was African American, and six (19%) were of mixed race. The children's ages ranged from 8.0 to 12.4, with a mean age of 9.5 years. Nine (29%) of the families had three children, and 22 (71%) of the families had two children.

Procedures

The procedures of the present study fall into two stages. In the first stage, naturalistic video data were collected in families' homes; self-report and physiological data were also obtained at this stage but are not a focus of the present investigation. In the second stage, children's emotion expressions were identified in the video footage and codes for behavioral characteristics and contexts of the children's anger expressions were developed and applied.

The original study, from which the data here were derived, spanned 4 days (two weekend days and two weekdays). Two trained ethnographic videographers were assigned to each family; each videographer recorded the daily activities of one parent between their waking and departure for school/work and between their first contact with a family member and the children's bedtime (Ochs et al., 2006). The recordings thus capture daily activities and interactions between parents and children in their natural environment (i.e., at home and in local community settings). The CELF lab compiled over 1,600 hr of transcribed video data for which software was developed to search the video data.

From this larger database, all video footage in which at least one parent and the target child were on screen was identified, in order to narrow the investigation to the parent–child context. Out of these video data (accumulated over two weekend days and two weekdays of observation), the one weekend day and the one weekday that maximized the number of available video clips were selected for further study. Video segments collected by the cameras following the mother and the father were examined separately. Total parent–child footage was capped at 100 min of footage per day per camera for a total of 400 possible minutes per family, although, of course, not every parent had 100 min of footage with the target child on each day of filming. Thus, unlike laboratory studies in which observation time is standardized, time spent on camera varied across children in this study. This process reduced the video data to a total of 125.6 hr across 31 families ($M = 243.1$ min of footage per family, $SD = 90.4$, range = 51.5 to 399).

A team of 16 female and three male ethnically diverse undergraduate research assistants from European American, Southeast Asian, Asian, and Latino backgrounds coded children's emotion expressions based on the verbal and nonverbal cues associated with happiness, sadness, surprise, disgust, fear, and anger (Ekman, 1992). Observable behaviors that connoted an anger expression were developed using narrative observations of the video data and out of previously published behavioral definitions of anger expressions (e.g., Cole, Teti, & Zahn-Waxler, 2003; Lindahl & Malik, 2000). Coders identified the emotion expressed and the exact time at which the behavior began. Each expression "ended" when the child either returned to a neutral expression or switched to an expression of one of the five other emotions that were coded.

As previously described, this study applies a cultural informant perspective, so coders were expected to use their own experience to help them differentiate emotions when behavioral cues were ambiguous. In observational studies like this one, interrater reliability is typically established in a small portion of the data (e.g., 20% of video clips), and once reliable coding is achieved, only one coder examines subsequent video clips. However, due to the complexity of the process of identifying often subtle emotion expressions with frequently moving children and videographers, for this study two independent raters coded *each* video segment for emotion expression and then met to discuss and resolve all disagreements about whether an emotion was expressed, which emotion was expressed, and the start time of the expressed emotion. In addition, for training purposes, new coders were required to establish reliability with video data that had already been double-

coded and resolved prior to coding new video material. Prior to the resolution of disagreements, interrater agreement for the identification of anger expressions in the video database was assessed; Cohen's kappa was .59, with 94% agreement between coders.

Behavioral characteristics of anger. "Anger" in this study describes a wide range of expressions, from mild irritation to outright physical aggression. When anger was identified, a separate group of six coders identified emotional behaviors, or "behavioral characteristics," and situational factors, or "context characteristics." Three types of behavioral signs of anger were coded: *Facial expressions* (frowns and eye-rolls), vocal behaviors (*loud voice* and *whining*), and physical behaviors (*physical behavior with an object*, *nonaggressive physical behavior with a person* and *aggressive physical behavior with a person*). Each behavioral characteristic listed in italics was dichotomously coded as either present or not present as a component of each expression. These behaviors were chosen to match the criteria that had been used to identify children's anger expressions during the initial coding process described above (Sperling, 2013). In addition to these behaviors, the expression's perceived *intensity* (low or high) and *duration* (less than or more than 2 s) were also coded. Because the anger expression was the unit of analysis, intensity was coded based on the highest intensity behavior exhibited during the expression; thus, longer expressions that fluctuate between high and low intensity behaviors would be dichotomously coded as having a "high" intensity. Table 1 provides abbreviated definitions of each code as they appeared in the anger expression coding manual (Sears & Repetti, 2012). Additional behaviors that were originally part of this coding manual were either too rare (e.g., clenched fists) or too difficult to identify reliably (e.g., more subtle facial expressions, such as raised eyebrows) to be included in further analyses.

Because two videographers had been present at all times during the original data collection, occasionally video footage content was duplicated (i.e., both cameras would capture the same emotion expression, but from different angles). Duplicated anger expressions were removed from further analysis, which resulted in a total of 1,273 unique anger expressions nested within the 31 participating children.

Contexts of anger. Because of the limited research literature on the naturalistic causes of school-age children's anger expressions, codes connoting the contexts of expressions were developed out of an iterative process using pilot data from the CELF video database. Pilot data consisted of the anger expressions occurring in a random selection of footage from five of the 31 participating children. During the development phase, coders watched the footage prior to and immediately following the anger expression and noted details about the situation that led up it. Categories for grouping these detailed descriptions were based in part on situational variables described in previous research, such as Fabes and Eisenberg (1992) and a range of laboratory tasks designed to evoke anger, as well as similar types of situations that arose naturally in the present study (e.g., doing homework). Once categories of situational contexts had been identified, they were included in the final coding system only if they achieved acceptable levels of reliability. As with the behavioral characteristic variables, each contextual variable was dichotomously coded; it either was or was not a component of the circumstances surrounding each anger expression. Data from the five children whose anger expressions were evaluated during the piloting process were ultimately included in the final dataset, but were coded using the final coding manual by research assistants who were "naïve" to the piloted families (i.e., who were trained after the piloting process had been completed).

More situational contexts were identified during the development phase than are included in the analyses presented here. Some, such as a child's explicit request for attention being ignored by another person or the child experiencing failure, were coded with interrater reliability (κ = .60 and .70, respectively) above the κ = .55 that was set as a minimally acceptable threshold for this study, but occurred so infrequently (each about .6 times per hour) that

Table 1

Characteristics of Anger Expressions

Variable	Operational definition	κ
Behavioral characteristics		
Facial expression	Frown/furrowed brow or rolled eyes	.59
Vocal behavior		
Loud voice	Includes slightly raised voice, screaming, and shouting.	.74
Whining	Using a complaining or whining tone without visible signs of crying/sadness.	.68
Physical behavior		
With an object	Hitting or throwing an object without harming it or another person (e.g., tossing a pencil down onto the table while doing homework).	.66
Nonaggressive, with a person	Hitting or shoving a person without harming them or any visible intent to harm (e.g., teasingly shoving a sibling who was leaning into the target child's side of the car's backseat).	.77
Aggressive, with a person	Physically aggressive behaviors, including any one of the following behaviors: grabbing something from someone, and/or hitting, kicking, shoving, or shaking someone hard or with visible intent to harm.	.71
Intensity		
Low intensity	Mild, quickly passing anger behavior (e.g., child frowns at a parent's request, or uses a slightly raised voice to protest a perceived injustice).	.55
High intensity	Escalated vocal (e.g., screaming) and/or physical behavior (e.g., throwing something, engaging in any aggressive behavior, and so on).	
Duration	Length of the anger expression, from first visible sign of anger to either (a) a return to a neutral expression, or (b) a change of expression from anger to another emotion (e.g., happiness, sadness). Coded as either less than 2 s or more than or equal to 2 s in length.	.57

there would not have been sufficient power to analyze their associations with other variables. Other situations, such as the child claiming that some action had been unfair, did not achieve acceptable levels of reliability ($\kappa = .48$), and thus were excluded from further analysis.

Five situational context codes achieved above-threshold interrater reliabilities and occurred frequently enough to provide sufficient power for further analyses: (a) *Verbal disagreements* (e.g., a child bickering with a sibling about whether or not there is life on Mars); (b) *Compliance requests and/or reprimands* (e.g., a parent asking a child to turn off the TV or saying "I told you to turn off the TV two times already!"); (c) *Refusals* (e.g., a parent not allowing a child to eat dessert); (d) *Homework*; and (e) *Nonaggressive physical acts* (e.g., a sibling dancing provocatively in front of the TV to block the target child's view).

In addition to these situations, coders identified two other contextual variables. *Parent instigator* indicated whether the child's mother or father caused the anger expression (if a nonparent or no person appeared to instigate the expression, then the parent instigator variable was coded as "missing"). *Previous anger* was coded as present if the expression in question occurred within 30 s of a prior anger expression made by the same child. More detailed definitions of each of these context codes are presented in Table 2.

To better illustrate the behavioral characteristic and context variables, imagine the following scenario: A child asks his mother for ice cream, but she says "You didn't finish all your homework before dinner—no dessert tonight." The child scowls and yells, "I *never* get dessert!" The expression is defined as beginning with the scowl—the first visible sign of anger—and ends as the child glances at the TV and his face returns to a neutral expression. For the purposes of this study, the "characteristics" of the expression would include (a) the child's overt angry behavior (the frown and loud voice); (b) the intensity of his affect; and (c) the duration of the expression (from the initial scowl to the return to neutral). The "context" of a child's anger expression includes (a) the "situational context" of the refusal of a desired item (dessert); and (b) "parent instigator" would be the mother. Previous anger would be noted for this expression if the child had exhibited a separate expression

of anger within 30 s prior to the scowl that marked the beginning of this expression.

Interrater reliability. The process of developing the coding system offers insight into some of the advantages and disadvantages of this fully naturalistic approach to the study of child emotion, including some trade-off of reliability to achieve a high level of external validity. Overt behaviors, such as physical gestures, and variables with very concrete definitions (e.g., use of a raised voice, or homework as a situational cause of the expression), were more likely to achieve higher reliability. Despite the challenges of coding events in a naturalistic setting, the range of kappas achieved in this study is comparable with observational laboratory studies of children's expressions of anger (e.g., Hubbard, 2001; Miller et al., 1986; Underwood et al., 1999).

As with the identification of emotion expressions described above, two independent raters coded the characteristics and contexts of each anger expression individually and then met to resolve all differences for 100% of the video clips included in this study. This policy was developed to ensure that hard-to-see or ambiguous characteristics and contexts that might be missed by one coder would be caught by the other and discussed. Because the study's coders (two male, four female) came from culturally diverse backgrounds (three European American, two Asian American, and one Mexican American), an additional benefit of this practice was that cultural differences in coders' interpretations were discussed and agreement achieved. Thus, study results (aside from reliability estimates, which were computed for each variable prior to the differences being resolved; see Tables 1 and 2) are based upon the values agreed upon by two coders.

Results

First, descriptive statistics are presented using two different methods for describing the frequency with which each anger characteristic and context appeared in the video data. Following this, multilevel modeling (MLM) analyses test differences in the anger characteristic and context variables between boys and girls and between children's interactions with mothers and fathers. The

Table 2

Contexts of Anger Expressions

Variable	Operational definition	κ
Previous anger	An anger expression had occurred within 30 s prior to the expression under evaluation.	.63
Parent Context		
Parent instigator	Defined as "mother" or "father" *if* the child appeared to perceive that a parent was responsible for the anger-eliciting event (e.g., "mother" would be coded as the parent instigator if the child expressed anger when his mother asked him to take out the trash). Coded as missing if something or someone other than parents instigated the expression (e.g., video game or sibling). Not mutually exclusive with situational contexts.	.76
Parent on screen	Expressions in which *either* the child's mother *or* father was on screen (mother: $n = 409$; father: $n = 349$); video footage in which both parents were on screen was coded as "missing."	.94
Situational Context		
Verbal disagreement	A verbal disagreement with another person (e.g., argument about whether there is life on Mars).	.62
Compliance/reprimand	Someone reprimanding or requesting compliance from the child (e.g., asking child to wash the dinner dishes or telling the child she was supposed to wash the dinner dishes).	.75
Refusal	Someone directly refusing to accede to the child's wishes (e.g., refusing child further TV time).	.71
Homework	Any homework-related event (e.g., struggling with a math problem).	.71
Physical act	A nonaggressive physical act (e.g., a sibling blocking child's view of the TV).	.61

intensity of anger expressions are explored next, and finally, associations between interpersonal situational contexts and behavioral characteristics are examined.

The Behavioral Characteristics and Contexts of Children's Anger Expressions

The frequency with which each behavioral characteristic and context occurred in the video are reported using two methods. The first describes the *rate of occurrence* per hour of video footage of each expression characteristic and context variable. The second method used MLM to determine the *proportion* of anger expressions in which a particular behavior or context occurred, while controlling for between-child variance. Both sets of descriptive statistics are presented in Table 3.

Rate of occurrence. The mean rates of each characteristic and context variable, as well as standard deviations and ranges, are presented in the first two columns of Table 3. Due to the occasional duplication of the original video footage from the two cameras, frequency per hour was estimated using an equation that incorporated the proportion of the total number of anger expressions identified out of the total number of hours of video footage (both including "duplicated" footage in which the two cameras captured overlapping events), and the proportion of characteristic

and context variables identified out of the total number of unique, nonduplicated anger expressions. Of the 1,273 angry expressions identified in 125.6 total hr of filming ($M = 12.0$ per hr, $SD = 9.9$, range of 1.7 to 38.5 across children), the vast majority was labeled as "low intensity." On average, each child expressed low intensity anger 10 times per hour of filming ($SD = 8.4$, range of 1.4 to 31.3), and high intensity anger two times per hour ($SD = 2.1$, range of 0 to 7). Overall, 80% of anger expressions were of short duration (< 2 s). Because intensity and duration were associated so closely, $\chi^2(1, N = 1,273) = 66.4, p < .001$, Pearson's $r = .23$, duration was dropped as a separate variable in the analyses that follow.

Among the 29 families with a mother and a father, mothers instigated anger expressions 3.6 times per hour that they were on screen with target child, and fathers 2.8 times per hour that they were on screen with target child, $t(28) = 1.12, p = .27$, Cohen's $d = .21$. Mothers were on screen with the child somewhat more often (an average of 3.33 hr per child) than fathers were (an average of 3.08 hr per child), $t(28) = 1.97, p = .06$, Cohen's $d = .37$. An anger expression occurred in the context of "previous anger" (in other words, within 30 s of a previous anger expression) about three times per hour.

Proportion of expressions. Due to the widely ranging number of expressions observed per child ($M = 41, SD = 40$, ranging from 3 to 181), empty multilevel logistic regression models (without any predictor variables) assessed through Stata 12 estimated the proportion of anger expressions in which each characteristic appeared, with the error associated with between-subjects differences removed. Multiple anger expressions (Level 1) were nested within individual children (Level 2):

$$\text{Log}\left[p_{ij} / (1 - p_{ij})\right] = B_{00} + u_{0j}. \qquad (1)$$

In Equation 1, p_{ij} is the probability that anger expression i from child j had a particular characteristic; B_{00} is the expected mean log odds of that characteristic across all children [which can be transformed into a probability using the equation: $p_{ij} = e^{B}/(1 + e^{B})$]; and u_{0j} is the deviation of child j from that mean. The percentage of variance explained by between-subjects differences across all of the variables listed in Tables 1 and 2 ranged from 5.6 to 51.9 (*Mean ICC* $= 19.4, SD = 12.3$), indicating that the use of multilevel models to examine the relationships between these variables was warranted (Snijders & Bosker, 2011).

As shown in Table 3, vocal behaviors were the most common behavioral characteristic of anger expressions. The use of a loud voice was the most frequently observed angry behavior, occurring in about 42% of expressions, followed by whining, which occurred in about 21% of expressions. An angry facial expression was the next most frequently observed angry behavior (17%). The coding of angry faces was primarily due to frowning, which occurred in 86% of the facial expressions; eye-rolling, the other facial expression variable, occurred in 15% of the cases when an angry face was observed. Physical behaviors were comparatively rare; aggressive physical behavior with a person ("physical aggression" hereafter) was especially uncommon, occurring in fewer than 4% of anger expressions.

Of the five situational contexts of expressions, verbal disagreements were the most commonly observed, accounting for about 37% of anger expressions. These were followed in frequency by compliance requests/reprimands, and nonaggressive physical acts

Table 3

Estimated Frequency of Child Anger Expression Characteristics and Contexts

Variable	Rate of occurrence per hour ($n = 31$)		Probability in Expression ($n = 1,273$)[a]
	Mean (*SD*)	Min–Max	%
Behavioral characteristics			
Long duration (≥ 2 s)	2.5 (2.7)	0–10.0	18.3
Short duration (< 2 s)	9.5 (8.0)	1.6–29.0	
High intensity	2.0 (2.1)	0–7.0	14.5
Low intensity	10.0 (8.4)	1.4–31.3	
Facial expression	2.1 (2.2)	0–7.2	16.2
Vocal behaviors			
Loud voice	4.5 (3.9)	0–15.1	41.7
Whine	2.7 (2.9)	0–12.3	20.7
Physical behaviors			
With an object	0.9 (1.3)	0–6.4	5.3
Nonaggressive, with a person	0.5 (0.5)	0–2.0	4.3
Aggressive, with a person	0.5 (0.7)	0–2.7	3.2
Contexts			
Previous anger	3.2 (5.2)	0–22.2	15.6
Parent instigator			
Mother ($n = 29$)	3.6 (3.9)[b]	0.28–13.9	59.3[c]
Father ($n = 29$)	2.8 (3.8)[b]	0–17.6	40.7[c]
Situational context			
Verbal disagreement	4.6 (4.5)	0–14.7	36.8
Compliance/reprimand	2.2 (2.5)	0–11.0	14.2
Nonaggressive physical act	1.4 (1.5)	0–6.1	9.8
Homework	1.4 (2.8)	0–13.5	3.1
Refusal of wish	0.9 (1.6)	0–8.3	5.1

[a] Probability of occurrence in any anger expression, adjusting for variation between children. [b] Rate per hour with that parent on screen (accounting for number of hours with that parent). [c] Based on all anger expressions for which a parent was the instigator ($n = 707$, or 55% of all expressions); only 29 families were included in the analyses because in two families the parents were both fathers.

(see Table 3). Across the children participating in this study, the likelihood of homework instigating anger expressions varied quite a bit, from 0 to 13.5 times per hour.

Child Sex Differences

Sex differences in the behavioral characteristics and contexts of children's anger expressions were assessed by testing whether some of the between-child variance in the probability of the observed outcome in Equation 1 could be attributed to the sex of the child (0 = female, 1 = male):

$$\text{Log } [p_{ij} / (1 - p_{ij})] = B_{00} + B_{01}(\text{sex}_j) + u_{0j}, \quad (2)$$

where B_{01} represents the added effect of being male on the dependent variable. The dependent variables included seven expression characteristics (facial expression, loud voice, whining, physical behavior with an object, nonaggressive physical behavior with a person, physical aggression, and intensity) and seven context variables (previous anger, parent instigator, and the five situational contexts), resulting in 14 separate models to estimate child sex differences in the likelihood of their occurrence. The B_{01} coefficient is a logit and the value itself is not interpretable, therefore odds ratios were calculated and the p value associated with the B_{01} coefficient presented. Among the 14 models, only one main effect of sex was observed: The odds of an anger expression being instigated by a compliance request or reprimand was 2.38 times greater for boys than for girls ($p < .01$).

Differences Between Mother– and Father–Child Interactions

The sex of the parent instigator was examined as a Level 1 variable (mother: $n = 352$ expressions; father: $n = 355$; no parent instigator was coded as "missing"). The two families headed by homosexual male couples were removed due to the absence of a mother for comparison. This approach is represented by Equation 3:

$$\text{Log } [p_{ij} / (1 - p_{ij})] = B_{00} + B_{10}(\text{parent sex}_{ij}) + u_{0j}$$
$$+ u_{1j}(\text{parent sex}_{ij}). \quad (3)$$

In this equation, B_{10} represents the change in the log odds of the dependent variable occurring in a given anger expression when the parent instigator is the father compared with the mother. Only one model of the 13 characteristics and contexts tested indicated a main effect of the sex of the parent instigator: the odds of an anger expression being preceded by "previous anger" were 1.7 times greater if the instigator was the father than if it was the mother ($p < .05$).

Anger Intensity

The next set of analyses explored variance in anger intensity at both the between- and within-subjects levels of analysis. First, we tested whether the frequency with which children expressed low intensity anger predicted the frequency with which they expressed high intensity anger. The rates per hour at which children expressed anger at low and high intensities were significantly positively correlated, $r(29) = .71$, $p < .001$, indicating that children who were more likely to express low intensity anger were also more likely to express high intensity anger.

Second, MLM analyses examined (a) whether the probability of observing a particular anger expression characteristic varied as a function of the intensity of that expression (1 = high intensity, 0 = low intensity); and (b) whether the probability of a high intensity expression varied according to the expression's situational context. To address the first question, the $intensity_{ij}$ variable was added at the level of the anger expression (Level 1) to the basic model (replacing parent sex in Equation 3). In this model, B_{10} represents the change in the log odds of the behavioral characteristic variable occurring in a given anger expression when the expression is high intensity in comparison to low intensity. Results indicated that all six behavioral characteristics tested as dependent variables were more likely to occur in the context of high intensity expressions. The odds of an angry facial expression occurring were 2.1 times greater in high intensity versus low intensity expressions ($p < .01$); the odds of loud voice 4.9 times greater ($p < .001$); the odds of whining 1.6 times greater ($p < .05$); the odds of physical behavior with an object 2.8 times greater ($p < .001$); the odds of nonaggressive physical behavior with a person 5.7 times greater ($p < .001$); and the odds of physical aggression 8.0 times greater ($p < .001$).

One possible explanation for this set of findings is that the definition of "intensity" applied by coders contained language that better categorized anger expressions with more than one behavioral characteristic (e.g., both vocal and physical) as "high intensity," whereas anger expressions with only one behavioral characteristic (vocal, in the example provided in the definition) would be better categorized as "low intensity" (see Table 1 for definitions used by coders). To test this hypothesis, a multilevel model with a Poisson distribution was used with expression intensity predicting a count of the number of behavioral characteristics that occurred during the expression. On average, high intensity expressions were indeed associated with 0.62 more coded characteristics than low intensity expressions ($p < .001$).

To address the second question, each of the seven situational contexts was separately entered into Equation 3 as a predictor of the expression's intensity. The odds of a high intensity expression were 3.4 times higher when the expression was immediately preceded by previous anger ($p < .001$), 1.5 times *lower* when the expression was instigated by a verbal disagreement ($p < .05$), and 2.07 times higher when the expression was instigated by a physical act ($p < .01$).

Associations Between Interpersonal Situational Contexts and Behavioral Characteristics

To address potential associations between behavioral characteristics and interpersonal situational contexts, each of the four situational contexts that involved actions taken by another family member (verbal disagreement, nonaggressive physical act, compliance request/reprimand, and refusal) were examined separately as Level 1 (expression-level) predictors of each of four behavioral characteristic variables that may have involved responses to that family member: facial expression, use of a loud voice, whining, and aggressive or nonaggressive physical behavior with a person (which were combined into one variable representing physical behavior with a person). This resulted in a total of 16 models. Of these, five models indicated significant associations between interpersonal contexts and expression characteristics. Significant odds ratios calculated from these logistic multilevel models are detailed in Table 4.

Table 4

Odds Ratios Representing the Co-Occurrence of Interpersonal Anger Expression Characteristics and Contexts

	Behavioral characteristics			
	Facial expression	Loud voice	Whine	Physical behavior with a person
Interpersonal contexts				
Verbal disagreement	1.05	.77	.58*	.57*
Nonaggressive physical act	.73	1.27	1.49	5.35***
Compliance/reprimand	1.06	.66*	1.09	.61
Refusal	.84	1.31	3.03***	.51

Note. Odds ratios below a value of 1 indicate that the characteristic is *less* likely to occur in the context of the given situation than in other situations.
* $p < .05$. ** $p < .01$. *** $p < .001$.

As expected, the overall pattern of results indicates that children employ strategies that functionally "match" the instigator's actions: For example, the odds of the target child using a physical action against another family member were 5.35 times greater when his or her anger was instigated by a physical action than when it was not ($p < .001$); the odds of the target child whining in response to a refusal were 3.03 times greater than in other contexts ($p < .001$).

Discussion

This study differs from most investigations of child emotion; it contributes to the research literature by describing school-age children's anger expressions occurring with their parents in their everyday environments and by offering a novel methodology for addressing the functionality of child anger behavior. We aimed to identify the angry behaviors in which children typically engage, the natural circumstances under which children express anger, the effects of the children's emotional contexts on their behavior (e.g., whether they had recently expressed anger), and the effects of specific situational contexts on children's behavior.

To summarize our findings, the vast majority of children's anger expressions were of low intensity, brief duration, and occurred independently of other anger expressions. The average child in our sample expressed low intensity anger 10 times per hour, and high intensity anger two times per hour—meaning, on average, children exhibited angry behaviors once every 5 min. It should be emphasized that this is a nonclinical sample of children, who from parent report fall within the average range with respect to disruptive behavior and emotional problems. We propose that the frequency of children's displays of mild intensity anger supports the functionalist approach to negative emotion, which asserts that focusing on expression valence fails to capture the normative expressions of negative emotion that allow children to get their needs met on a daily basis (Campos et al., 1989; Cole, Martin, & Dennis, 2004).

The Composition and Contexts of Children's Anger Expressions

Anger expressions in this study were more often characterized by vocal (e.g., whining) than physical (e.g., hitting) behavior or facial expressions. It is likely, however, that due to the nature of the video data (e.g., that children could be facing away from the camera during an anger expression such that vocal but not facial behavior could be identified by coders), the rate of angry facial expressions identified in this study may be a low estimate. The primary finding, however, that the vast majority of children's anger expressions were of low intensity and brief duration, would not be likely to be altered by uncovering more frequent angry facial expressions. Physical aggression occurred relatively infrequently, averaging about once every 2 hours. Few gender differences (between boys and girls or mothers and fathers) were observed: It should be noted that, in light of the study's limited power and consistent with expectations described in the introduction, the significant group differences that were observed occurred at near chance leve1.

In terms of anger expression contexts, verbal disagreements were the most common cause of children's anger expressions, occurring on average nearly five times per hour. Other anger-inducing situations (in descending order of frequency) included requests for compliance or reprimands, homework, nonaggressive physical causes, and refusals of the children's wishes. Future experimental studies designed to evoke angry responses in school-age children may draw on these data to increase ecological validity: Laboratory tasks in which children engage in verbal disagreements with family members may overlap more with anger-eliciting events that occur in children's daily lives than, say, frustrating games that can't be won. However, naturalistic settings do offer some unique opportunities to observe anger-inducing situations that cannot be replicated experimentally without raising ethical concerns (e.g., physical provocation).

The data did reveal linkages between the characteristics of an anger display and the situational context in which it occurred. Children were more likely to whine in response to refusals, and were more likely to engage in physical behavior with a person in response to physical acts, than in other situations. Children were also somewhat less likely to use a loud voice when being reprimanded or asked to comply with a request, and were somewhat less likely to whine and engage in physical behavior with others in response to verbal disagreements. Although we did not offer specific hypotheses regarding which angry behaviors may be "functional" in certain interpersonal contexts, these findings are consistent with the idea that all angry behaviors are not created equal: Children appear to be engaging in specific behaviors to obtain specific goals. Whining is attention-grabbing and represents

an attempt to obtain a desired outcome either through a request or refusal (Baskett, 1985; Chang & Thompson, 2010); therefore, it follows that children would be more likely to whine in response to a refusal of a desired item or activity. Similarly, youths report that they are more likely to engage in physical aggression in the context of physical provocation, such as being shoved, whereas they are more likely to engage in relational aggression in response to verbal provocation (Dirks et al., 2007). Both findings are consistent with children's behavior "matching" their needs in the situation.

Consistent with the finding that physical acts generate physical anger expressions, physical causes also instigated higher intensity expressions, whereas verbal disagreements were associated with lower intensity expressions. Previous anger also predicted high intensity anger expressions, and occurred just over three times per hour. It seems inevitable that daily practice managing the mild negative emotions that arise in typical home settings forms the basis of emotion regulation abilities as they develop throughout childhood: We propose that the variable "previous anger" may offer some insight into children's ability to regulate their emotion. Fruzzetti, Shenk, and Hoffman (2005) suggest that individuals who experience difficulty returning to baseline after being emotionally aroused (i.e., poor regulators) may maintain higher-than-baseline arousal after the original event, which may cause subsequent similar emotional responses to be more extreme when the next emotional stimulus occurs. This process has been referred to as "augmentation" (Pe & Kuppens, 2012). Along the same lines, Raush's (1965) study of boys with behavior problems suggests that effective emotion regulation may be represented better by the ability to quickly resolve angry interactions rather than by preventing angry interactions from occurring. "Previous anger" may tap into this regulatory phenomenon in a way that most brief laboratory tasks are less able to address, given that they do not typically capture the rise and fall of anger expressions over time across different situations.

Study Limitations

Studying naturally occurring child anger presents challenges as well as unique opportunities. The study sample is necessarily small given the intensity of the data collection—a total of 31 target children and their parents. To allow comparisons of parents and to be able to observe children with siblings, the sample was limited to two-parent households with two to three children, and the participating families were predominantly middle class. This restricted sample limits the inferences that can be made about the "average" child's angry behavior and the circumstances under which children's anger expressions occur. Further, the age range (8–12) captures a period of transition to early adolescence that also limits inferences about the "average" child's behavior given the possible role of age differences in behaviors and situations. Pubertal timing has been shown to be associated with differences in responses to emotional stimuli (e.g., Silk et al., 2009); it would be important for future naturalistic studies of emotion expression to address not only middle childhood and adolescence, but the transition between the two.

Additionally, because this study focused on the parent–child relationship, all anger expressions occurred in the presence of at least one parent. This study's methodology offered the unique opportunity to capture children's interactions with their parents complete with the complications and interruptions of real life—for example, a child may respond to one parent's refusal of a desired object by going to the other parent (the opportunity to do which might mitigate an angry response), which cannot be observed in a laboratory study where only one parent is present or all three sit at a table and share the same discussion. However, one limitation of this focus on the parent–child relationship is that inferences about children's behavior when parents were not present cannot be made. For example, the characteristics of children's interactions with their siblings might look different when away from parental supervision. It would be very interesting for future studies to apply these methods to sibling or peer interactions.

The development of reliable coding systems is a particular challenge for researchers using naturalistic data (and likely one that has contributed to its dearth in the literature). This is in part due to difficulties associated with video data collection in home settings such as poor lighting, frequent movements and often half-covered images of family members, and poor audio quality. In previous observational studies of children's angry emotional expressions, interrater reliability has varied widely, even in laboratory studies; those that examine only fairly intense, overt signs of anger expressions are able to achieve higher levels of interrater reliability (e.g., Fabes & Eisenberg, 1992). Thus, a major hurdle in the current investigation was the development of procedures for coding unprompted interactions in everyday family settings that would reliably describe the full range of children's anger expressions, whether mild or intense. Though two expert raters coded each anger expression and all differences were resolved to address the difficulty of coding such specific behavioral and situational variables, it is likely that a certain amount of error inherent in video coding remains in the data set. To achieve our aim of describing a normative sample of angry expressions as exhibited in daily life, some level of interrater reliability has thus been traded for higher ecological validity.

Another frequent concern in this type of research is that the presence of two videographers may have affected the family members' behavior; however, we believe that the disruption was considerably less at home as these busy dual-earner families engaged in their normal daily routines than it would have been in an unfamiliar setting or if the families had been prescribed tasks and situations. Thus, despite these limitations, we believe that these data provide a good representation of how this sample of parents and children behave on a daily basis.

Implications and Future Directions

Children's anger expressions do not exist in a vacuum. An important next step in naturalistic research on children's emotion expressions in family contexts is to address the transactional nature of these interactions. This should include assessing the role of parent behavior in shaping children's emotion regulation and anger expression. For example, a child may recover from a conflict with a parent, only to have anger retriggered by the parent's behavior, resulting in repeated anger expressions that are not necessarily reflective of the child's ability to self-regulate. Future studies might also examine the functionality of the normal range of anger expressions in naturalistic family contexts by examining the immediate outcomes of children's anger expressions—that is, how effective the expression characteristics were at meeting the spe-

cific needs of the situation—as well as placing this range in the context of broader developmental outcomes (e.g., disruptive behavior problems). Further, externally visible emotion expression only tells half the story; studies of children's perceptions and physiology paired with observation techniques broaden our understanding of the child's whole experience (e.g., Locke, Davidson, Kalin, & Goldsmith, 2009; Parker et al., 2001).

Our findings have implications for non-naturalistic research on children's anger regulation. First, the ubiquity of minor expressions of irritation suggests that these brief and subtle expressions of emotion should be included in the purview of the broader research literature. Investigating the *whispers* of anger, in addition to the *shouts*, offers researchers an opportunity to examine emotion in the way it is repeatedly experienced by children, as well as in more intense forms. Second, the dynamic flow of child emotion expression that we observed in natural settings could be captured in laboratory studies by including sequences of activities and interactions that require children to self-regulate in the face of repeated stressors. Less structured laboratory paradigms would reveal a broader range of interpersonal transactions and different patterns of the ebb-and-flow of anger.

Theoretical research on emotion regulation continues to struggle to operationally define this complex, multifaceted construct. Theoretically driven investigations, such as those that occur in laboratory contexts, have generated a series of unique, context-specific, investigator-specific definitions of emotion, emotion regulation, and adaptive coping behavior. Naturalistic methods like those described in this study offer an unconventional way to "zoom out" in the study of emotion expression and, in tandem with more targeted, controlled approaches, move the literature toward a more comprehensive understanding of emotion processes.

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